July 7, 2017 EPA Review of Union Carbide Corp. Bayer CropScience Facility Updated Vapor Intrusion Risk Assessment dated April 2014

1. Section 1.2, Conceptual Site Model

Revise the third paragraph of this section to reference the UCC Screening Level Human Health for Soil and Shallow Groundwater (2016) which recognizes exposure to surface and subsurface soils and shallow groundwater as complete.

2. Section 4, Human Health Risk and Vapor Intrusion Evaluations

The first sentence of this section characterizes the subslab soil vapor as "future indoor air" and the subslab vapor calculated risks as "future exposure scenarios." Actually, these results represent currently measured subslab vapor, and do not predict future subslab or indoor air concentrations. The subslab vapor risk calculations can only be considered worst case modeled indoor air risks, and are primarily useful in identifying driver chemicals in subslab soil vapor. Revise this entire section to replace future with worst case modeled.

3. Section 6, Summary

a) Replace future in this section with "worst case modeled."

b) This section states that no further evaluation of the VI pathway is proposed for the 12 buildings. However, the SV results for Building 3 are of concern for tetrachloroethene (PCE) and trichloroethene (TCE), and will require continued monitoring of both subslab soil vapor and indoor air. While groundwater is not a source of PCE, this chemical is consistently elevated in the subslab samples implying a subsurface soil source, and drives modeled indoor air risk estimates up to an HI of 16. In addition, five paired indoor air samples were not collected, including for the maximum PCE subslab concentration, so the effect on indoor air is uncertain. The TCE subslab concentrations drove modeled indoor air risk estimates up to 1E-4 and an HI of 38, and TCE is present in groundwater. While neither chemical drove an unacceptable risk in indoor air, the subslab concentrations are too elevated and the data set too limited to eliminate concern for these chemicals and indoor inhalation risk. It also would be more informative if additional sampling locations were added to Building 3. Please provide a monitoring work plan for Building 3.

c) This section states that no further evaluation of the VI pathway is proposed for the 12 buildings. However, location BLD-15-IA8 in Building 15 had a HI of 4, of which 50% is due to naphthalene, which is also present in groundwater (no subslab soil vapor samples could be collected in Building 15). Further monitoring for naphthalene must be conducted for Building 15. Current groundwater data collection for naphthalene would also be helpful. Since there is a HQ exceedance, if indoor sources are also suspected for naphthalene, these should be identified and removed or controlled. Please provide a monitoring work plan for the naphthalene in Building 15.

d) This section states that no further evaluation of the VI pathway is proposed for the 12 buildings. However, the Building 137 subslab results for the groundwater chemicals were greatly elevated resulting in high modeled indoor air risk estimates (2E-3, 57). Although this did not translate to the indoor air results in terms of unacceptable risk, only two rounds of indoor air have been obtained. Please provide a work plan to conduct a third confirmatory round of subslab and indoor air sampling.

4. Table 3-1, Analytical Results for Building 2 and Appendix C

a) A random verification of laboratory Forms I compared to the tabled data revealed that 2-methylnaphthalene was analyzed and reported as non-detect for samples BLD-2-IA9, 11, and 13 – 18, but is shown as "—" in Table 3-1 (meaning NA). Explain and correct as necessary.

b) SDG M2631 includes a Form I for sample SV1D, yet these results are not shown in Table 3-1, which instead shows "—" meaning NA for this sample. Explain and correct.

c) A review of the DQE for the 2013 data revealed that 2-methylnaphthalene should have been R qualified for the sample results BLD-2-SV1 to SV5, rather than "—" meaning NA. Revise accordingly and thoroughly review that all applicable qualifiers from the DQE were applied.

d) The SDG M2631 Forms I for BLD-2-SV1 through SV6 show results (some greatly diluted) which do not match the results shown for any of these samples in Table 3-1. This is a major discrepancy and further review of these results was halted. Conduct a complete audit and provide an explanation and revised tables.

5. Table 3-3, Analytical Results for Building 4 and Appendix C

The first, third and fifth pages of Table 3-3 are cut off. Revise to provide a complete table.

6. Table 3-3, Analytical Results for Building 4, Appendices C and D, and Table 4-2

a) The Table 3-3 results for BLD-4-SV4 Nov 2010 do not match the Appendix C Form I results for this sample. Oddly, results for BLD-4-IA1 Nov 2010, -IA2 May 2010, -SV3 Oct 2009, -SV5 Oct 2009 and -IA6 May 2010 were confirmed in the Appendix C Form Is.

b) The Appendix D concentrations for the BLD-4-SV4 Nov 2010 results do not match those shown in Table 3-3 or the Appendix C Form I.

c) The risk ratios in Appendix D for the following subslab soil vapor results are all incorrect: BLD-4-SV1 Oct 2009, BLD-4-SV2 Oct 2009, BLD-SV3 Oct 2009, BLD-4-SV4 Oct 2009; review was halted at this point.

d) These are major discrepancies, and further review of Table 3-3 and Building 4 was halted. Conduct a complete audit and provide an explanation and revised tables.

7. Table 3-5, Analytical Results for Building 21 and Appendix C

The results for BLD-21-IA/SV1 and -IA/SV2 in SDG M2604 do not match the results shown in Table 3-5, and there is no laboratory report for BLD-21-IA/SV1FD. This is a major discrepancy and further review of the Building 21 results was halted. Conduct a complete audit and provide an explanation and revised tables.

8. Table 3-6, Analytical Results for Building 23 and Appendix C

SDG M2611 does not contain a Form I for the BLD-23-SV5 or -SV1 results. Provide the Form Is and explain.

9. Table 3-7, Analytical Results for Building 52 and Appendix C

a) No Form I results in SDG M2604 match the results in Table 3-7. This is a major discrepancy and further review of the Building 52 results was halted. Conduct a complete audit and provide an explanation and revised tables.

b) SDG M2604 does not contain a Form I for BLD-52-IA/SV1FD. Provide the Form I and explain.

10. Table 3-8, Analytical Results for Building 70 and Appendix C

a) The Form I results in SDG M2642 do not match the table results for BLD-70-SV1 through SV6. This is a major discrepancy and further review of these results was halted. Conduct a complete audit and provide an explanation and revised tables.
b) SDG M2642 does not contain Form Is for the BLD-70-SV1FD or BLD-70-IA3FD results. Provide the Form Is and explain.

11. Table 3-9, Analytical Results for Building 74 and Appendix C

a) The Form I results in SDG M2670 do not match the table results for BLD-74-SV1 through SV6. This is a major discrepancy and further review of these results was halted. Conduct a complete audit and provide an explanation and revised tables.
b) SDG M2670 is missing the Form I for the BLD-74-SV1FD results. Provide the Form I and explain.

12. Table 3-10, Analytical Results for Building 130 and Appendix C

a) There appear to be no Form Is for the May 2010 results for soil vapor and indoor air, so these results were reviewed no further. Provide the Form Is and explain.
b) No Form I was found for BLD-130-SV1FD Nov 2010. Provide the Form I and explain.

13. Table 3-11, Analytical Results for Building 131 and Appendix C

a) SDG M2650 does not contain any Form Is for BLD-131-SV1 through SV6 that match the results shown in Table 3-11. This is a major discrepancy and further review of these results was halted. Conduct a complete audit and provide an explanation and revised tables.
b) SDG M2650 does not contain Form Is for BLD-131-SV1FD or IA2FD. Provide the Form Is and explain.
c) Table 3-11 shows no results for bis(2-chloroisopropyl)ether, naphthalene, and 2-methylnaphthalene for indoor air samples BLD-131-IA1 to IA3 and others depending on the chemical; however, the Form Is contain results for these chemicals. The same occurs for some indoor air carbon disulfide results in this table. Explain: if these results were R qualified, that should be shown in the table with the reason for rejection rather than "—".

14. Table 3-12, Analytical Results for Building 137 and Appendix C

No Form Is were found in either SDG I2798 or J3284 for BLD-137-SV1 Nov 2010, BLD-137-IA3FD and SV3FD May and Nov 2010, and all of the May 2010 results. This is a major discrepancy and further review of these results was halted. Conduct a complete audit and provide an explanation and revised tables.

15. Table 4-1, Summary of Current Carcinogenic Risks and Noncarcinogenic Hazards for Indoor Air

a) For Building 3, the ELCR and HI entries for BLD-3-IA4 June 2010 are inconsistent with the Appendix D Risk Calculation Detail Tables, which show 2E-5 and 6E-1, instead of 3E-5 and 8E-1. Explain and/or correct.

b) For Building 15, this table shows the carcinogenic risk driver for location BLD-15-IA1 as naphthalene, which is in error. The risk driver is 1,4-dichlorobenzene. Correct this table and Section 4.2.4.
c) For Building 15, this table shows the HI for location BLD-15-IA2 as 9E-2, which is incorrect according to Appendix D showing a HI of 7E-2. Correct.
d) For Building 15, this table and Appendix D shows the carcinogenic cumulative risk as 3E-6 for location BLD-15-IA6; however, the ELCRs shown in the appendix sum to 4E-6. Correct.
e) For Building 15, this table shows the percent contribution of the carcinogenic risk driver for location BLD-15-IA8 as 76% (naphthalene), which is incorrect. Correct to 90%.
f) For Building 23, this table and Appendix D show 2E-5 as the carcinogenic cumulative risk for location BLD-23-IA1; however, the ELCRs in Appendix D actually sum to a rounded 3E-5. Correct both.

16. Table 4-2, Summary of Future Carcinogenic Risks and Noncarcinogenic Hazards for Subslab Soil Vapor
a) Revise this title to replace with the following: Summary of Worst Case Carcinogenic Risks and Noncarcinogenic Hazards for Indoor Air Using the Subslab Soil Vapor Results.
b) For BLD-130-SV1 Nov 2010, the ELCR is incorrect for this table and Appendix D. The cumulative ELCR rounds to 1E-4, not 9E-5. Correct.

17. Appendix A, Table 1
a) Why was No Further Evaluation concluded for Building 271, since it has VI potential and occupation is unknown?
b) For Building 8419, which is occupied and characterized as having VI potential, explain what is meant by "VI potential at the WWTU is minimal compared to the Main Plant. No further evaluation proposed."

18. Appendix D, Risk Calculation Detail Tables
a) The risk calculation tables for the SV sample results are difficult to use, because the screening values applicable to indoor air are shown, rather than those values adjusted for sub-slab soil vapor. While no revision is requested, this error made the review cumbersome.
b) The table for BLD-3-SV3 May 2010 is cut off. Revise this page to include the full table.
c) The table for BLD0131-IA5 is cut off. Revise this page to include the full table.
d) The Building 137 sheets of Appendix D include calculations for BLD-137-IA4FD and BLD-137-SV1FD, neither of which are included in Table 3-12 and for which there were no Form Is. Explain.